

1 **SEWER RELIEF VALVE WITH INTEGRAL DISINFECTANT MEANS**

2 FIELD OF THE INVENTION

3 This invention is related to a cap for a sewer clean out which functions as a
4 release valve, and particularly to such a valve which includes an integral disinfectant
5 means for sewer effluent.

6

7 BACKGROUND OF THE INVENTION

8 In a conventional residential sewer collection system, discharge from various
9 receptacles present in the interior plumbing arrangement drains into a vertical
10 collection line and then into a sewage collection line. Households are usually
11 connected to the sewer line by clay, cast-iron, or polyvinyl chloride (PVC) pipes 3 to
12 4 inches in diameter. The sewage collection line conducts sewage collected from
13 various receptacles present in the interior plumbing into a sewer main or septic tank.
14 Unlike water-supply systems, wastewater flows through sewer pipes by gravity rather
15 than by pressure. Due to the lack of pressure, blockages can occur in the sewer
16 collection line, which can have the very unpleasant result of sewer water backing up
17 in sinks, toilets, and bathtubs. This is a particular problem for multi-story buildings,
18 since the sewer lines on the lower floor can become clogged while higher stories
19 continue to empty water into the sewer line, which can cause the lower floors to be
20 flooded with sewer water.

1 Building codes require sewer systems to have clean outs which provide access
2 to clear blockages in the sewage collection line as may occur over time with the line
3 becoming partially blocked by tree roots or other foreign objects. The clean out
4 allows the blockage to be reached using tools such as plumbing snakes. The clean
5 out is usually a vertical conduit extending from the sewage line to a point at or near
6 ground level. The upper end of the clean out has internal threads so that a cap or
7 fitting with mated threads can be screwed therein.

8 It is well known in the art to replace the clean out cap with an escape valve so
9 that sewage back up will overflow through the clean out, instead of overflowing into
10 toilets, sinks etc. Some prior art patents are directed to blow-out type caps ejectable
11 by pressure present in the pipes, such as U.S. Patents No. 4,261,386, 3,895,466, and
12 4,850,059. Valve type sewer backflow preventors include 5,645,099, 4,917,147,
13 4,215,724.

14 Baker, Jr., U.S. Patent No. 5,209,257, discloses a vent for relieving pressure in
15 a sewer system which comprises a threaded plug having a buoyant float closure
16 seated therein. The elongated configuration causes the float to reseal itself.

17 Westerhoff, U.S. Patent No. 3,805,826, discloses a relief valve which is
18 substituted for the normal plug which comprises two concentric cylindrical portions
19 slidable with respect to one another. The upper portion is sealed at the top, and
20 includes side vents for discharge. A screw keeps the upper portion from being

1 ejected by pressure.

2 Several prior art patents disclose an arrangement wherein an audible buzzer is
3 activated in the event of an overflow. For example, Young et al., U.S. Patent No.
4 4,392,128, Allen, U.S. Patent No. 4,091,365, and Statz, U.S. Patent No. 4,398,186
5 each discloses a device where an electric circuit is closed by the mechanical action
6 caused by the rising water to set off a warning alarm.

7 The prior art systems are effective to provide a means by which backflow into
8 interior plumbing fixtures is prevented. While it is certainly preferable that the
9 sewage backflow overflow in an outdoor environment rather than inside, the presence
10 of the effluent on the ground can create a health hazard. Children and pets in
11 particular can easily come into contact with the unsanitary ground area.

12 Thus, what is needed is a means to chemically treat sewage water overflowing
13 from a clean out in order to reduce or eliminate harmful bacteria present in the
14 sewage overflow, as well as to neutralize foul odors. The present invention
15 overcomes the drawbacks of the prior art devices by providing a sewer clean out cap
16 which functions as an overflow valve, and which also includes an integral means of
17 disinfecting sewer effluent as it flows through the device so that the immediate
18 environment is not contaminated.

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1 SUMMARY OF THE INVENTION

2 It is an objective of the invention to provide a sewer relief valve assembly for
3 a sewer clean out which prevents interior sewer flooding by providing an exterior
4 valve outlet to release pressurized fluids.

5 It is a further objective of the invention to provide a sewer relief valve
6 assembly which includes an integral disinfectant means in the form of a water-soluble
7 composition to treat overflow fluids discharged through the clean out.

8 It is another objective to provide a sewer relief valve assembly for a sewer
9 clean out which includes a water-soluble dye composition disposed therein so that
10 effluent from the clean out is dyed a highly visible color.

11 It is still another objective to provide a sewer relief valve assembly for a sewer
12 clean out which includes an alarm means to indicate that an overflow has occurred.

13 It is a further objective of the invention to provide a sewer relief valve
14 assembly which includes a light-emitting diode (LED) which is illuminated for a
15 specified period after an overflow has occurred.

16 It is yet a further objective of the invention to provide a sewer relief valve
17 assembly which includes a refillable perforated compartment formed integrally
18 therewith for receiving water-soluble dye and disinfectant compositions.

19 In accordance with the above objectives, a sewer relief valve assembly for a
20 sewer clean out having interior threads comprises a cylindrical sleeve dimensioned

1 for insertion into the clean out which has an interior surface formed as a conduit and
2 exterior threads adapted for mated engagement with the interior threads of the clean
3 out. A valve means is disposed in the cylindrical sleeve which is displaceable from a
4 closed position to an open position by pressurized fluid in the clean out. At least one
5 perforated compartment is disposed inside the cylindrical sleeve which contains a
6 water-soluble disinfectant composition. The valve means is displaceable by fluid
7 pressure to the open position permitting discharge of the effluent through the clean
8 out and the simultaneous release of the water-soluble disinfectant composition from
9 the perforated compartment into the effluent. A water-soluble dye composition can
10 also be included in the perforated compartment so that sewage overflow from the
11 clean out is readily visible. The perforated compartment can comprise a plurality of
12 walls defining an interior space, with one of the walls including a hingedly moveable
13 door member having a latch means attached thereto whereby the interior space can be
14 accessed to replenish the water-soluble disinfectant and/or dye composition.

15 In a preferred embodiment, the cylindrical sleeve can include at least two
16 longitudinal slots therein having a length and an upper portion terminating in a
17 flange. The valve means can comprise a float member vertically displaceable in the
18 cylindrical sleeve which has an upper portion having a configuration complementary
19 to the flange. The upper portion is seated in the flange in the closed position and
20 includes a top surface which forms a cover for the clean out in the closed position.

1 The float member further comprises an elongate lower portion descending into the
2 cylindrical sleeve which preferably has a frusto-conical configuration. The lower
3 portion includes at least two arms extending laterally therefrom corresponding to the
4 at least two slots which are slidably positioned in the slots such that the float member
5 is fixedly attached to the cylindrical sleeve and upwardly vertically displaceable
6 along the length of the longitudinal slots to the open position.

7 The device can further include a sensing means for detecting when the valve
8 means is in an open position and an alarm means coupled to the sensing means which
9 is activated when the valve is in the open position. A timing means can be coupled to
10 the alarm means so that the alarm means is activated continuously for a
11 predetermined period after the valve is opened. The alarm means can be a light-
12 emitting diode (LED) which is illuminated in response to the opening of the valve.

13 In a preferred embodiment, the components of the alarm mechanism are
14 disposed inside the float member. The upper portion and lower portion of the float
15 member are detachable from one another to provide access to the alarm mechanism,
16 and preferably respectively include mated threads. The alarm mechanism can
17 comprise a first magnetic strip adjoined to the cylindrical sleeve and a second
18 magnetic member strip adjoined to the float member such that the first magnetic strip
19 and the second magnetic strip are in contact with one another when the float member
20 is in the closed position. An electric circuit is disposed within the float member in

1 electrical communication with a power source such as a battery. An alarm means in
2 electrical communication with the circuit, and a switch means is in communication
3 with the second magnetic strip and the electric circuit, with the switch being
4 operable to energize the electric circuit when contact between the first and second
5 magnetic strips is terminated, wherein the alarm means is activated when the contact
6 is broken. A timing means can be coupled to the alarm means, wherein the alarm
7 means is activated continuously for a predetermined period.

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1 BRIEF DESCRIPTION OF THE FIGURES

2 Fig. 1 is an exploded view of a preferred embodiment of the invention in
3 which the sewer relief valve assembly is shown disassembled from a clean out pipe;

4 Fig. 2 is a cross section view of the sewer relief valve assembly installed in a
5 clean out with the valve means in a closed position;

6 Fig. 3 is a cross section view of the sewer relief valve assembly installed in a
7 clean out with the valve means in a closed position;

8 Fig. 4 is perspective view of the float member, shown disassembled from the
9 device;

10 Fig. 5 is a cutaway view of the cylindrical sleeve showing the longitudinal slot
11 and the perforated compartment therein;

12 Fig. 6 illustrates a preferred configuration for an alarm means in the float
13 member;

14 Fig. 7 illustrates an alternative arrangement for attachment of the float
15 member to the cylindrical sleeve, in which the valve means is in a closed position;
16 and

17 Fig. 8 illustrates the device shown in Fig. 7, in which the valve means is in a
18 open position and the LED is illuminated in response.

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2 DETAILED DESCRIPTION OF THE INVENTION

3 Although the invention will be described in terms of a specific embodiment, it
4 will be readily apparent to those skilled in this art that various modifications,
5 rearrangements, and substitutions can be made without departing from the spirit of
6 the invention. The scope of the invention is defined by the claims appended hereto.

7 Fig. 1 is an exploded view of the instant invention in which the sewer relief
8 valve assembly 10 according to a preferred embodiment of the invention is shown
9 disassembled from clean out pipe 7. The clean out pipe 7, typically four inch PVC
10 pipe, is vertically oriented and extends from the sewer pipe line to a point just above
11 the ground. The clean out pipe 7 is generally provided with a removable threaded
12 plug which engages with the interior threads 8 of the clean out pipe 7. In Fig.1, the
13 threaded plug has been removed to permit installation of the device 10 into the clean
14 out pipe 7.

15 The device 10 includes a cylindrical sleeve 12 dimensioned to fit coaxially
16 within the clean out 7. The cylindrical sleeve 12 has an upper end terminating in a
17 flange 16, and includes threads 14 adjacent the flange 16 which securely threadingly
18 engage with threads 8 of the clean out 7. In a preferred embodiment, the cylindrical
19 sleeve is formed from polyvinyl chloride (PVC).

20 A valve means 18 is slidably disposed in the cylindrical sleeve 12 which is

1 displaceable from a closed position to an open position by pressurized fluid in the
2 clean out. The operative elements of the valve means 18 can be seen in the cross-
3 sectional views shown in Figs. 2 and 3. In the embodiment shown in Figs. 2 and 3,
4 the cylindrical sleeve 12 fits in close alignment with the clean out 7. The cylindrical
5 sleeve includes at least two longitudinal slots 22 and 23 (seen in detail in Fig. 5) ,
6 which can be formed either as channels or apertures. The valve means 18 can
7 include float member 24 which is vertically displaceable within the cylindrical sleeve
8 12. The float member 24 has an upper portion 25 which has a configuration which is
9 complementary to the flange 16 so that the upper portion 25 is seated in the flange 16
10 when the valve means is in closed position, as shown in Fig. 2. The upper portion 25
11 has a top surface 27 which forms a cover for the clean out 7. The float member 24
12 includes an elongate lower portion 28 descending into said cylindrical sleeve 12
13 which preferably has a frusto-conical configuration. As can be best seen in Fig.4, the
14 lower portion includes at least two arms 32, 33 extending laterally therefrom. The at
15 least two arms are positioned to correspond with the slots 22, 23 such that the arms
16 32, 33 are slidably positioned in said slots 22,23. The float member 24 is thus fixedly
17 attached to the cylindrical sleeve 12, and is upwardly displaceable along the length
18 of the longitudinal slots to an open position. Pressurized fluid in the clean out
19 pushes the float member 24 upward until the arms 32, 33 encounter the top edges 42,
20 43 of the slots 22,23. Fluids can then flow out of the cylindrical sleeve 12. When

1 the pressure subsides, the float member 24 automatically falls to be reseated in the
2 flange 16, and in this way reciprocates back to the closed position. The
3 components of the float member 24 of the present invention can be manufactured
4 using polyvinyl chloride (PVC), or any other suitable material.

5 An alternative embodiment for the cylindrical sleeve is shown is shown in
6 Figs. 7 and 8. In this embodiment, the diameter of the cylindrical sleeve 12 is
7 dimensioned to provide a space 40 between the clean out 7 and the sleeve 12. The
8 distal ends of the arms 32, 33 extend into the slots 22, 23 and respectively include a
9 first end member 45 positioned inside the sleeve 12 and a second end member 46
10 positioned in said space 40 whereby the arms 32, 33 are slidably disposed inside the
11 slots 22,23.

12 The cylindrical sleeve 12 includes therein at least one perforated compartment
13 30 positioned to be in the path of the liquid flow. The perforated compartment 30
14 contains a water-soluble disinfectant composition, indicated in Figs. 2 and 3 as 34.
15 The water-soluble disinfectant composition 34 can be in tablet form (as shown in
16 Figs 2 and 3) or alternatively can be in the form of a powdered substance.

17 Any suitable disinfectant agent can be used in the practice of the present
18 invention. The disinfectant composition 34 preferably includes antimicrobial
19 compositions manufactured into a solid form. The antibacterial compounds are
20 preferably U.S. Environmental Protection Agency approved for use as sanitizers or

1 disinfectants. Appropriate antimicrobial agents include, but are not limited to,
2 quaternary ammonium compounds, fatty amines and diamines, chlorhexidine
3 gluconate, phenol and halogen or methyl substituted phenols, parachlorometa xylenol
4 methyl substituted phenols, parachlorometa xylenol, and mixtures thereof.

5 As liquids flow through the cylindrical sleeve 12, the liquid enters the
6 perforated compartment 30 and flows therethrough. The disinfectant composition 34
7 then permeates the effluent prior to expulsion to the environment.

8 In the illustrated embodiment shown in Fig. 5, the perforated compartment 30
9 is a rectangular prism, however, in the practice of the invention, the compartment 30
10 can have any desired configuration. For example, the compartment 30 can be formed
11 as an annular ring within the cylindrical sleeve 12 to maximize the volume of fluid
12 encountering the disinfectant composition 34. Any number of perforated
13 compartments 30 can be included in the cylindrical sleeve 12. The perforated
14 compartment 30 is constructed to include a plurality of walls defining an interior
15 space. One of the walls preferably includes a hingedly moveable door member (not
16 shown) which has a latch means allowing the interior space to be accessed to
17 periodically replenish the water-soluble disinfectant composition 34. If the water-
18 soluble disinfectant composition 34 is in tablet form, the tablets can be manufactured
19 to have a complementary fit to that of the interior space for ease of replacement.

20 In addition to the water-soluble disinfectant composition 34, the perforated

1 compartment 30 can also include a water-soluble dye composition, which can be
2 impregnated into the water-soluble disinfectant composition 34 or provided
3 separately. The water-soluble dye composition dyes the effluent as it flows out of
4 the clean out 7 so that it will be immediately evident to an observer that an overflow
5 has taken place. The dye color is selected for the maximum degree of visibility in
6 the environment. For example, the dye color can be a bright color (such as red or
7 blue) or can be a phosphorescent color.

8 The device 10 may include an alarm mechanism which indicates an overflow
9 through the clean out. The device 10 can have a sensing means for detecting when
10 said valve means is in an open position which is coupled to an alarm means. The
11 alarm means is activated when the valve is in the open position. A timing means is
12 preferably coupled to the alarm means so that the alarm is activated continuously for
13 a predetermined period. For example, the device 10 can include a light-emitting
14 diode (LED) 38 positioned in the top surface 27 of the upper portion 25 of the float
15 member 24 as shown in Fig. 1. When the valve means 18 is opened by pressurized
16 fluids, the LED 38 is illuminated for a predetermined period (e.g., 24 hours).

17 To provide access to the alarm means, the upper portion 25 and the lower
18 portion 26 of the float member are preferably detachable from one another and
19 configured to provide an interior compartment therein to house the alarm means as
20 can be seen in Fig 6. The upper and lower portions 25, 26 are formed as generally

1 hollow shells which can be detached from one another by means of mated threads 29.

2 A preferred means of implementing the alarm means is shown in Fig. 6. A first
3 magnetic strip 48 is adjoined to the cylindrical sleeve 12, and a second magnetic strip
4 49 is adjoined to said float member 24 so that the first magnetic strip 48 and second
5 magnetic strip 49 are in contact with one another when the float member 24 is in the
6 closed position. An electric circuit generally indicated as 50 is disposed in the upper
7 portion 25 of the float member 24 which is in electrical communication with the
8 alarm means. The circuit 50 includes a power source, such as a battery (not shown).
9 A switch means (not shown) is in communication with the second magnetic strip 49
10 and the electric circuit 50. The switch means is operable to energize the electric
11 circuit when contact between the first and second magnetic strips is terminated to
12 activate the alarm means. A timing means is coupled to said switch means to
13 continuously activate the alarm means for a predetermined period. The foregoing
14 illustrates an example of an alarm configuration, however the invention is not limited
15 in this regard. Any suitable electronic configuration can be used. The illustrated
16 embodiment incorporates a lighted indicator as the alarm means, however an audible
17 alarm can also be used. An RF transmission means can also be used to activate an
18 alarm in a remote setting, such as inside the residence.

19 All patents and publications mentioned in this specification are indicative of the
20 levels of those skilled in the art to which the invention pertains. All patents and publications

1 are herein incorporated by reference to the same extent as if each individual publication was
2 specifically and individually indicated to be incorporated by reference.

3 It is to be understood that while a certain form of the invention is illustrated, it is not to be
4 limited to the specific form or arrangement herein described and shown. It will be apparent
5 to those skilled in the art that various changes may be made without departing from the
6 scope of the invention and the invention is not to be considered limited to what is shown and
7 described in the specification. One skilled in the art will readily appreciate that the present
8 invention is well adapted to carry out the objectives and obtain the ends and advantages
9 mentioned, as well as those inherent therein. The various embodiments, methods,
10 procedures and techniques described herein are presently representative of the preferred
11 embodiments, are intended to be exemplary and are not intended as limitations on the scope.
12 Changes therein and other uses will occur to those skilled in the art which are encompassed
13 within the spirit of the invention and are defined by the scope of the appended claims.

14 Although the invention has been described in connection with specific preferred
15 embodiments, it should be understood that the invention as claimed should not be unduly
16 limited to such specific embodiments. Indeed, various modifications of the described modes
17 for carrying out the invention which are obvious to those skilled in the art are intended to be
18 within the scope of the following claims.